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ABSTRACT

Included in this document are selections of topic-specific articles on heroin research reprinted from the National Institute on Drug Abuse's (NIDA) research newsletter, "NIDA Notes." Titles include: "Buprenorphine Taken Three Times Per Week Is as Effective as Daily Doses in Treating Heroin Addiction"; "33-Year Study Finds Lifelong, Lethal Consequences of Heroin Addiction"; "Buprenorphine Proves Effective, Expands Options for Treatment of Heroin Addiction"; "Nicotine Craving and Heavy Smoking May Contribute to Increased Use of Cocaine and Heroin"; "Drug Abuse Treatment Programs Make Gains in Methadone Treatment and HIV Prevention"; "Recovery Harder for Addicts Who Start Young"; "High-Dose Methadone Improves Treatment Outcomes"; "Heroin Snorters Risk Transition to Injection Drug Use and Infectious Disease"; "Heroin, Marijuana, Methamphetamine Use on the Rise"; "Linking Medical Care with Drug Abuse Treatment Stems Tuberculosis among HIV-Infected Drug Users"; "NIH Panel Calls for Expanded Methadone Treatment for Heroin Addiction"; "NIDA Conference Aims 'Preemptive Strike' at Increased Heroin Use among Nation's Young People"; "Applying Scientific Research Can Counter Rise in Heroin Use"; "Rate and Duration of Drug Activity Play Major Roles in Drug Abuse, Addiction, and Treatment"; "Vocational Screener Helps Methadone Patients Overcome Job Barriers"; and "Heroin Update: Smoking, Injecting Cause Similar Effects: Usage Patterns May Be Shifting." (GCP)

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A Collection of

NIDA NOTES

NATIONAL INSTITUTE ON DRUG ABUSE

Articles That Address

RESEARCH ON HEROIN

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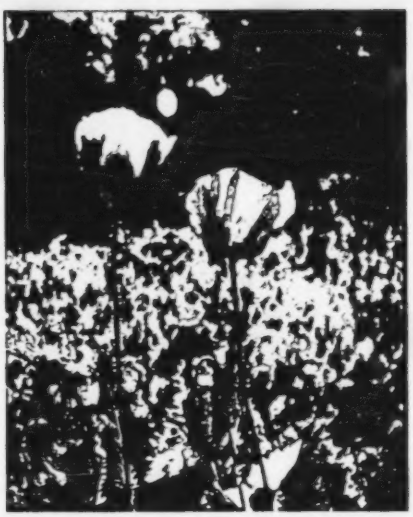
Articles That Address



Research on Heroin

Department of Health and Human Services
National Institutes of Health
National Institute on Drug Abuse

NN0023

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Introduction

The National Institute on Drug Abuse (NIDA) supports more than 85 percent of the world's research on drug abuse and addiction. NIDA-funded research enables scientists to apply the most advanced techniques available to the study of every aspect of drug abuse, including:

- genetic and social determinants of vulnerability and response to drugs;
- short- and long-term effects of drugs on the brain, including addiction;
- other health and social impacts of drug abuse, including infectious diseases and economic costs;
- development and testing of medication and behavioral treatments for abuse and addiction; and
- development and evaluation of effective messages to deter young people, in particular, from abusing drugs.

Included in this document are selections of topic-specific articles reprinted from NIDA's research newsletter, *NIDA NOTES*. Six times per year, *NIDA NOTES* reports on important highlights from NIDA-sponsored research, in a format that specialists and lay readers alike can read and put to use. Selections like the current one are intended to remind regular *NIDA NOTES* readers and inform other readers of important research discoveries during the periods they cover.

We hope the information contained here answers your needs and interests. To subscribe to *NIDA NOTES* and for further information on NIDA's drug abuse and addiction research, please visit our Web site at www.drugabuse.gov.

Table of Contents

Buprenorphine Taken Three Times per Week Is as Effective as Daily Doses in Treating Heroin Addiction (V16-4; October 2001) 1

33-Year Study Finds Lifelong, Lethal Consequences of Heroin Addiction (V16-4; October 2001) 3

Buprenorphine Proves Effective, Expands Options For Treatment of Heroin Addiction (V16-2; May 2001) . . 5

Nicotine Craving and Heavy Smoking May Contribute to Increased Use of Cocaine and Heroin (V15-5; October 2000) 6

Drug Abuse Treatment Programs Make Gains in Methadone Treatment and HIV Prevention (V15-3; August 2000) 8

Recovery Harder for Addicts Who Start Young (V14-6; March 2000) 10

High-Dose Methadone Improves Treatment Outcomes (V14-5; December 1999) 11

Heroin Snorters Risk Transition To Injection Drug Use And Infectious Disease (V14-2; August 1999) 13

Heroin, Marijuana, Methamphetamine Use On the Rise (V13-5; February 1999) 15

Linking Medical Care With Drug Abuse Treatment Stems Tuberculosis Among HIV-Infected Drug Users (V13-3; July 1998) 16

NIH Panel Calls for Expanded Methadone Treatment for Heroin Addiction (V12-6; November/December 1997) 18

NIDA Conference Aims "Preemptive Strike" at Increased Heroin Use Among Nation's Young People (V12-6; November/December 1997) 19

Applying Scientific Research Can Counter Rise in Heroin Use (V12-6; November/December 1997) . . . 21

Rate and Duration of Drug Activity Play Major Roles in Drug Abuse, Addiction, and Treatment (V12-2; March/April 1997) 23

Vocational Screener Helps Methadone Patients Overcome Job Barriers (V11-3; May/June 1996) 27

Heroin Update: Smoking, Injecting Cause Similar Effects; Usage Paterns May be Shifting (V10-4; July/August 1995) 29

NIDA NATIONAL INSTITUTE ON DRUG ABUSE
Research Findings
Volume 16, Number 4 (October 2001)

Buprenorphine Taken Three Times per Week Is as Effective as Daily Doses in Treating Heroin Addiction

By Patrick Zickler, *NIDA NOTES* Staff Writer

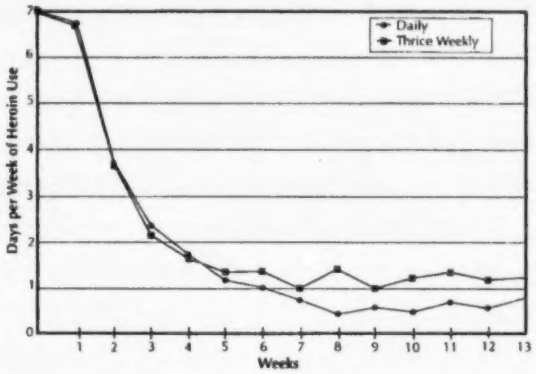
Buprenorphine, a medication developed through NIDA-funded research, has been shown in clinical trials to be an effective treatment for opioid addiction when taken in daily doses. Research at Yale University School of Medicine in New Haven, Connecticut, now suggests that buprenorphine taken three times per week is similarly effective. This finding, says NIDA-supported investigator Dr. Richard Schottenfeld, makes buprenorphine an even more flexible alternative to methadone, a medication that has been used for decades to treat opioid addiction.

Methadone is the most widely used medication for opioid addiction, yet fewer than one in five heroin users now receive methadone treatment for their addiction, Dr. Schottenfeld says. A daily dosing requirement and distressing symptoms of withdrawal that can result from a missed dose cause some heroin users to drop out of or to forgo methadone treatment programs. "Buprenorphine has relatively mild withdrawal symptoms, and a treatment schedule that does not require daily dosing could significantly increase the number of heroin users seeking treatment when buprenorphine becomes available," he says. Buprenorphine is in the final stages of the Food and Drug Administration (FDA) approval process.

Dr. Schottenfeld and his colleagues compared the effectiveness of daily versus thrice-weekly administration of buprenorphine in a 12-week trial involving 92 participants (73 percent white, 75 percent male) who met diagnostic criteria for opioid dependence and FDA criteria for eligibility in methadone maintenance treatment, but who were not currently in treatment. Forty-five participants were assigned to receive daily buprenorphine in an average daily dose of 16 mg per 70 kg of body weight. Forty-seven participants received doses of 34 mg per 70 kg of body weight on Fridays and Sundays, 44 mg per 70 kg of body weight on Tuesdays, and a placebo on other days. All 92 study participants provided urine samples on Mondays, Wednesdays, and Fridays. All samples were analyzed for opioids and cocaine metabolites, and one sample per week from each participant was tested for benzodiazepines.

"There were no significant differences between groups in reduction of opioid use, in retention in the treatment program, or in cocaine use," Dr. Schottenfeld says. "Interviews with the participants suggest that they couldn't reliably tell whether they were receiving the medication daily or three times each week."

Daily or Thrice-Weekly Buprenorphine Doses Yield Similar Declines in Days of Drug Use



Patients in treatment for opioid addiction received either daily or thrice-weekly doses of buprenorphine. Both groups showed reductions in reported days of heroin use during a 13-week treatment program.

Roughly three-quarters of the participants (77 percent of those receiving thrice-weekly and 71 percent of those receiving daily medication) completed the full 12-week program. The proportion of opioid-positive urine samples dropped consistently through the course of treatment (to 57 percent in the daily and 58 percent in the thrice-weekly group), and participants in both groups reported substantial reductions in illicit drug use. The similarity in drug use is evidence that the participants felt no stronger urge to use opioids than those on the daily schedule, Dr. Schottenfeld says. Equally important, he notes, is the fact that both groups were equally likely to stay in treatment, to show up on time for treatment, and to attend regularly scheduled counseling sessions.

In this study, all participants made daily clinic visits even though the thrice-weekly group received medication only every third day. Additional research is needed to determine the effectiveness of thrice-weekly dosing on a schedule that does not require daily contact, Dr. Schottenfeld says. Still, he adds, the finding that thrice-weekly dosing can be as effective as daily dosing in treatment outcome is an important step forward that builds on previous research indicating that some patients would prefer less-than-daily dosing of medication.

"This schedule of treatment could substantially reduce the cost to clinics and the inconvenience to patients. It can also help move use of buprenorphine beyond the traditional narcotic treatment programs and into new treatment settings, such as primary care clinics or physicians' offices," Dr. Schottenfeld says.

Source

- Schottenfeld, R.S.; Pakes, J.; O'Conner, P.; Chewarski, M.; Oliveto, A.; and Kosten, T.R. Thrice-weekly versus daily buprenorphine maintenance. *Biological Psychiatry* 47(12):1072-1079, 2000. NN

NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 16, Number 4 (October 2001)

33-Year Study Finds Lifelong, Lethal Consequences of Heroin Addiction

By Patrick Zickler, *NIDA NOTES* Staff Writer

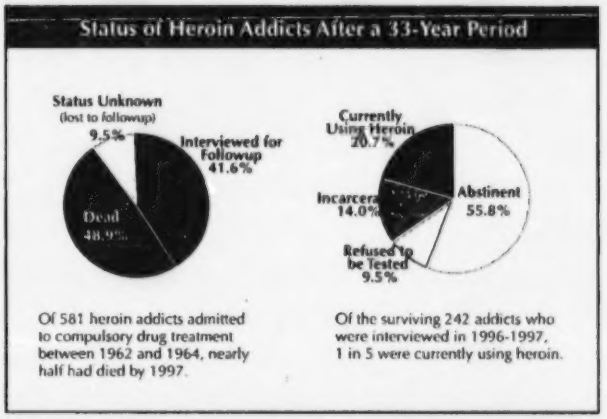
Heroin addiction exacts a terrible toll. For many addicts the condition lasts a lifetime—a lifetime shortened by health and social consequences of addiction. NIDA-supported researchers at the University of California, Los Angeles (UCLA), examined the patterns and consequences of heroin addiction over 33 years in nearly 600 heroin-addicted criminal offenders and found that their lives were characterized by repeated cycles of drug abuse and abstinence, along with increased risk of crime or incarceration, health problems, and death.

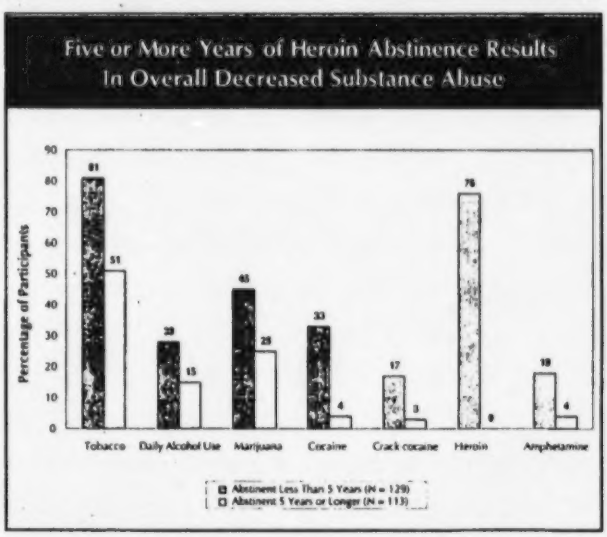
Drs. Yih-Ing Hser, Valerie Hoffman, Christine Grella, and Douglas Anglin of UCLA's Drug Abuse Research Center studied a group of 581 male heroin addicts admitted between 1962 and 1964 to the California Civil Addict Program (CAP), a compulsory drug treatment program for criminal offenders. By 1997, nearly half of the group had died, roughly 40 percent of those still living reported using heroin within the past year, and fewer than 10 percent of the survivors were currently enrolled in methadone treatment.

The death rate among the members of the group is 50 to 100 times the rate among the general population of men in the same age range. "The high mortality rate is evidence of the severe consequences of heroin use," Dr. Hser says. "Even among surviving members of the group, severe consequences such as high levels of health problems, criminal behavior and incarceration, and public assistance were associated with long-term heroin use."

Researchers first interviewed the participants during the period 1962 through 1964 and conducted followup interviews at roughly 10-year intervals–in 1974 and 1975, 1985 and 1986, and 1996 and 1997. In the most recent interviews, the UCLA researchers found that 284 (49 percent) of the 581 addicts enrolled in CAP between 1962 and 1964 had died. The most common cause of death (21.6 percent) was accidental poisoning or drug overdose. Homicide, suicide, or accident accounted for 19.5 percent of deaths, and the next most common causes were liver disease, cancer, and cardiovascular diseases (15.2, 11.7, and 11.7 percent, respectively). Fifty-five original participants could not be located, refused to be interviewed, or could not be interviewed.

Of the 242 surviving members interviewed in 1996 and 1997, 135 (55.8 percent) were not currently using heroin, 50 (20.7 percent) were actively using heroin, and 23


Status of Heroin Addicts After a 33-Year Period
Status Unknown (lost to followup) 9.5%
Interviewed for Followup 41.6%
Dead 48.9%
Currently Using Heroin 20.7%
Incarcera 14.0%
Abstinent 55.8%
Refused to be Tested 9.5%
Of 581 heroin addicts admitted to compulsory drug treatment between 1962 and 1964, nearly half had died by 1997.
Of the surviving 242 addicts who were interviewed in 1996-1997, 1 in 5 were currently using heroin.



During interviews conducted in 1996 and 1997, heroin abusers who had been continuously abstinent for at least the last 5 years were less likely than other abusers to have used other drugs in the past year.

(9.5 percent) refused to provide urine samples for testing. In addition, urine samples were not available from 34 men who were incarcerated at the time of the interviews.

During any given year, roughly 10 percent of participants were in treatment, according to Dr. Hser. "Although many of the survivors reported that they had been able to stop using heroin for extensive periods, fewer than half reported abstinence for periods of more than 5 years," Dr. Hser

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says. "Abstinence for 5 years significantly reduced the likelihood of relapse, but even among those who achieved 15 years of abstinence, a quarter still relapsed." Those who achieved abstinence for more than 5 years were more likely to be employed and less likely to report that they had health problems that prevented them from working, were receiving public assistance, or had been involved in criminal activity than were the rest of the cohort. Rates of HIV, hepatitis, and sexually transmitted diseases did not differ very much between those who had achieved more or less than 5 years of abstinence.

Dr. Hser adds that the results of the 33-year followup study should be considered in light of the fact that all members of the study originally were selected from a corrections-based treatment program and may not be representative of addicts who would have voluntarily sought treatment in community-based facilities had those programs been available 30 years ago. "Nevertheless, we believe the findings on patterns of heroin use and related consequences have important implications for the study of heroin addicts generally," Dr. Hser says. "These results suggest that heroin addiction treatment programs should prepare addicts for the fact that relapse is a very real possibility. Most people go into treatment thinking that they will be cured and not return to addiction, but abstinence is very difficult to maintain."

Heroin addicts and treatment providers should understand that treatment is a way to achieve abstinence and that recovery consists of improvements resulting from those periods when they are free of addiction, Dr. Hser says.

Source

- Hser, Y-I.; Hoffman, V.; Grella, C.E.; and Anglin, M.D. A 33-year follow-up of narcotics addicts. *Archives of General Psychiatry* 58(5):503-508, 2001.

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NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 16, Number 2 (May 2001)

Buprenorphine Proves Effective, Expands Options For Treatment of Heroin Addiction

By Josephine Thomas, *NIDA NOTES* Contributing Writer

NIDA-supported researchers continue to expand treatment options for heroin addicts. A recent clinical trial showed that buprenorphine can be as effective as levo-alpha-acetyl-methadol (LAAM) and high-dose methadone in the treatment of heroin addiction. All three of these medications are more effective than low-dose methadone.

Dr. Rolley Johnson of The Johns Hopkins University in Baltimore led the research team that compared the different types of opioid addiction treatment medications. The team randomly assigned 220 heroin-addicted volunteers between the ages of 21 and 55 to 1 of 4 treatments: 16 to 32 mg of buprenorphine 3 times a week; 75 to 115 mg of LAAM 3 times a week; high-dose (60 to 100 mg daily) methadone; or low-dose (20 mg daily) methadone.

Effectiveness of Four Treatment Medications for Opioid Addiction

	Buprenorphine n=55	LAAM n=55	High-Dose Methadone n=55	Low-Dose Methadone n=55
Average number of days that patients remained in treatment	96	89	105	70
Percentage of patients with 12 or more consecutive drug-free urine samples	26	36	28	8

n=number of patients in treatment group

Buprenorphine proved as effective as LAAM and high-dose methadone in treating patients addicted to heroin. All three medications were more effective than low-dose methadone.

Treatment effectiveness was measured through participants' reports of heroin use, medication and drug levels in participants' urine samples, and how long participants remained in the study. Participants in the buprenorphine, LAAM, and high-dose methadone groups who completed the study reported that their heroin use decreased 90 percent on average. Urine tests conducted 3 times a week revealed that LAAM produced the longest period of abstinence; 36 percent of these patients had 12 consecutive heroin-free urine samples. A total of 26 percent of buprenorphine and 28 percent of high-dose methadone patients, but only 8 percent of the low-dose methadone patients, had 12 consecutive negative tests. Overall, 50.9 percent of the study's participants completed the 17-week study. The retention rates ranged from a high of 72.7 percent in the high-dose methadone group to 58.2 percent in the buprenorphine group, 52.7 percent in the LAAM group, and 20 percent in the low-dose methadone group.

"This study illustrates that there is more than one alternative for the effective treatment of heroin addiction," says Dr. Frank Vocci, director of NIDA's Division of Treatment Research and Development. "Although methadone remains the 'gold standard,' the new medications do not have to be administered in public clinics and closely supervised in the way high-dose methadone administration has been in the past. The results of this research thus open the door to medical mainstreaming—treatment in doctors' offices and private facilities, rather than only in narcotic treatment programs—for individuals addicted to heroin."

"This research demonstrates that these three medications are effective for the treatment of heroin addiction and that a one-size-fits-all model is no longer necessary," says Dr. Johnson. "Future research will help clinicians identify which patients will benefit most from which medications.

"Heroin addiction is a chronic brain disease, and we can treat it like any other chronic medical condition—considering alternatives for treatment and planning that treatment based on individual patient needs," Dr. Johnson continues. "Since it is difficult to have this kind of medical model of treatment with only one medication, expanding the numbers and types of potential treatment medications should help bring the treatment of opiate addiction into mainstream medical practice."

Source

- Johnson, R.E., et al. A comparison of levomethadyl acetate, buprenorphine, and methadone for opioid dependence. *New England Journal of Medicine* 343(18):1290-1297, 2000. NN

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NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 15, Number 5 (October 2000)

Nicotine Craving and Heavy Smoking May Contribute to Increased Use of Cocaine and Heroin

By Patrick Zickler, *NIDA NOTES* Staff Writer

People who abuse drugs are also likely to be cigarette smokers. More than two-thirds of drug abusers are regular tobacco smokers, a rate more than double that of the rest of the population. NIDA researchers have found that craving for nicotine appears to increase craving for illicit drugs among drug abusers who also smoke tobacco, and this relationship suggests that smokers in drug treatment programs may be less successful than nonsmokers in staying off drugs.

At NIDA's Intramural Research Program in Baltimore, Dr. Stephen Heishman and his colleagues examined the interaction of craving for nicotine and craving for other drugs and found that situations that increased desire to smoke also increased desire to use drugs. The study involved male and female adult smokers who were not trying to stop smoking and had histories of abusing alcohol, cocaine, heroin, marijuana, and/or other substances.

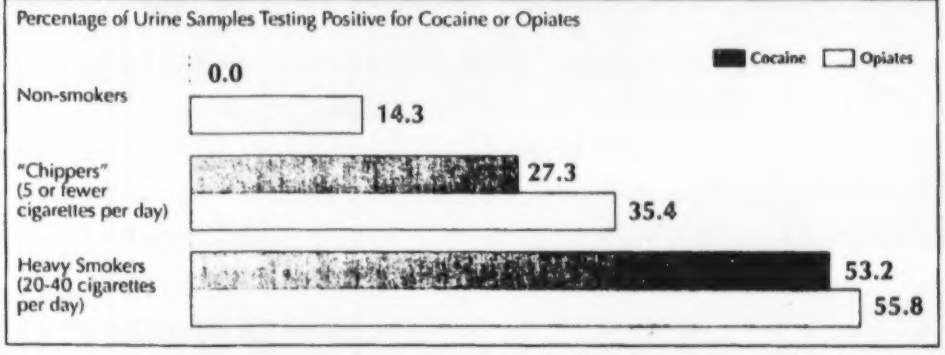
The researchers asked participants to listen to recorded scripts describing scenes and then to rate their urge to smoke and their desire to use other drugs. In the first part of the study, which involved 18 participants, the scripts had content that was generally pleasant (watching children on a sunny beach), unpleasant (a friend asking to borrow money), or neutral (doing household chores). Some scripts also included people expressing a desire to smoke, while others did not mention smoking at all (see "Cues Trigger Craving"). Both the scripts including a mention of smoking and those containing negative emotional content increased the participants' craving for drugs, as well as for smoking.

In the second part of the study, 24 participants heard scripts with only pleasant content (enjoying the beach, talking on the phone with an old acquaintance, or visiting friends). These scripts also contained descriptions of tobacco craving that increased in intensity from no mention of smoking to asking the question, "How could you really enjoy yourself fully unless you were smoking?" Participants reported that craving for both drugs and tobacco increased as the intensity of the tobacco craving messages in the scripts increased.

"One of our more interesting findings was that scripts that elicited craving for tobacco also elicited craving for the subject's drug of choice. This suggests that real-world situations that produce tobacco craving also may result in craving for drugs of abuse," Dr. Heishman says. The findings also suggest that treatment for heroin, cocaine, or alcohol addiction might be more effective if it included concurrent treatment of tobacco addiction, he says.

In a NIDA-supported study at the University of California, San Diego, doctoral candidate Dominick Frosch and his colleagues at the Integrated Substance Abuse Program at the University of California, Los Angeles, investigated the relationship between levels of cigarette smoking and levels of cocaine and heroin use among 32 individuals who had been in a methadone treatment program for at least 4 months. The participants included 10 nonsmokers (6 female, 4 male) and 22 smokers (16 female, 6 male). The smokers were equally divided among heavy smokers (20 to 40 cigarettes per day) and "chippers" who smoked 5 or fewer cigarettes per day.

Cigarette Smoking Associated With Use of Cocaine and Opiates



Among patients in a methadone treatment program for opiate addiction, levels of cocaine or opiate use were directly related to levels of cigarette smoking.

"Compared with heavy smokers, chippers have less intense craving for their first cigarette of the day and can more comfortably avoid smoking in situations where it is not permitted," Mr. Frosch explains.

The researchers evaluated the connection between tobacco smoking and illicit drug use among the smokers and nonsmokers by using breath and urine samples from the participants over a 7-day period. They found that the amount of cocaine and heroin use was closely related to the level of tobacco use. "The more cigarettes smoked, the more likely the person was to use illegal drugs," Mr. Frosch says. "These findings provide compelling reasons for implementing smoking cessation programs for patients in methadone treatment, as the benefits of smoking cessation may extend to opiate addiction as well."

Sources

- Taylor, R.C.; Harris, N.A.; Singleton, E.G.; Moolchan, E.T.; and Heishman, S.J. Tobacco craving: intensity-related effects of imagery scripts in drug abusers. *Experimental and Clinical Psychopharmacology* 8(1):75-87, 2000.
- Frosch, D.L.; Shoptaw, S.; Nahom, D.; and Jarvik, M.E. Associations between tobacco smoking and illicit drug use among methadone-maintained opiate-dependent individuals. *Experimental and Clinical Psychopharmacology* 8(1):97-103, 2000. NN

Cues Trigger Craving

To evaluate the impact of the urge to smoke on craving for other drugs, Dr. Stephen Heishman and his colleagues asked participants to rate their desires for tobacco and other drugs after listening to recorded "scripts" of scenes involving pleasant, unpleasant, or neutral situations and containing "urge" or "no-urge" smoking cues. The scripts were originally developed by Dr. Stephen Tiffany and colleagues at Purdue University.

Pleasant, no-urge script: You're at the beach, lying on a blanket. The warm sun penetrates your skin and relaxes you thoroughly. A fresh breeze blows over your body as you run your hands through the clean white sand and let the grains fall through your fingers. You're feeling refreshed and at ease, and pleasant thoughts run through your mind. You can hear the sound of waves splashing rhythmically against the shore. Nearby there are some children playing a game. A bright red beach ball lands near your blanket. You look up and see two of the children running toward you to get their ball. You stand up, pick up the ball, and toss it to them. They laugh and giggle and run back to their game. You go to the blanket and lie down. You're enjoying this day completely.

Pleasant, urge script: You're at a friend's house sitting in a big comfortable chair. You're with people you've known a long time, and you're enjoying yourself very much. You're sipping a drink, and you're feeling totally at ease. Many of your friends are smoking cigarettes, just as you used to do. You've gone an entire week without smoking. As you sit there listening to the conversation and laughter, you begin to wonder what a cigarette would taste like. The more you think about smoking, the stronger your desire becomes. Maybe just tonight when you're with your friends and having a good time, it would be okay to smoke. How could you really enjoy yourself fully unless you were smoking? Your desire to smoke becomes intense, and you know that there's no good reason not to ask one of your friends for a cigarette.

Sources

Tiffany, S.T., and Drobes, D.J. Imagery and smoking urges: the manipulation of affective content. *Addictive Behavior* 15(6):531–539, 1990.

Tiffany, S.T., and Hakenwerth, D.M. The production of smoking urges through an imagery manipulation: psychophysiological and verbal manifestations. *Addictive Behavior* 16(6):389–400, 1991.

NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 15, Number 3 (August 2000)

Drug Abuse Treatment Programs Make Gains in Methadone Treatment and HIV Prevention

By Steven Stocker, *NIDA NOTES* Contributing Writer

Drug abuse treatment programs have substantially improved their methadone treatment practices and increased their HIV prevention efforts since the late 1980s, according to recent NIDA-funded research. These improvements appear to be partly the result of NIDA's efforts to improve drug abuse treatment and HIV/AIDS outreach.

Clinical studies conducted in the late 1980s and early 1990s indicated that methadone treatment is more likely to reduce heroin use if the dose level is at least 60 milligrams per day (mg/day), if patients are given a voice in determining their dose levels, and if no restriction is placed on treatment duration. Subsequent research, however, indicated that the majority of the Nation's methadone treatment facilities were dispensing methadone doses less than 60 mg/day, were not giving patients a voice in dosage decisions, and were encouraging patients to stop taking methadone in 6 months or less.

In response to this situation, NIDA and other Federal agencies took steps to improve methadone treatment. NIDA funded an Institute of Medicine report that recommended changes in heroin addiction treatment practices and their regulation. NIDA also funded the development of a quality assurance program that evaluates methadone treatment facilities in terms of patient outcomes. In addition, the Center for Substance Abuse Treatment (CSAT) developed a set of methadone treatment guidelines and distributed them to State substance abuse agencies and treatment providers around the country.

To determine whether these efforts were in fact improving methadone treatment practices, in 1995 Dr. Thomas D'Aunno of the University of Chicago and his colleagues at the University of Michigan in Ann Arbor collected data from 116 methadone treatment facilities located throughout the country and compared them with data collected on these same facilities in 1988 and 1990. Results showed improvement during the 7-year period, particularly regarding methadone dosage. The average dose was 45 mg/day in 1988 and 46 mg/day in 1990. By 1995, however, the average dose had increased to 59 mg/day. Also, more programs were allowing patients to participate in dosage decisions, and more programs were waiting at least a year before encouraging patients to stop taking methadone.

The treatment facilities most likely to conduct HIV prevention activities were those that had more patients at high risk of HIV infection, more resources, and lower patient-to-staff ratios.

"Although these results show that methadone treatment facilities have made substantial improvements, we still need to make more progress," says Dr. D'Aunno. "We found an average dose of 59 mg/day in our sample of treatment facilities, but recent research indicates that doses between 80 and 100 mg/day may be the most effective in reducing heroin use." (See "High-Dose Methadone Improves Treatment Outcomes.")

The study found differences in treatment practices in different areas of the country and for different population groups. Dr. D'Aunno suggests that efforts targeted at particular groups of programs may be a further step to improve treatment.

Dr. Bennett Fletcher of NIDA's Division of Epidemiology, Services, and Prevention Research agrees that efforts to improve methadone treatment practices should continue but adds that misunderstandings some patients have about methadone may also contribute to the problem. For example, he says, some patients attribute adverse effects to methadone that it actually does not cause. "These patients may develop medical or dental problems while taking heroin, but they don't notice them either because of heroin's analgesic effect or because they are distracted by withdrawal symptoms during abstinence," he says. "Once they're in methadone treatment and physiologically stabilized, the medical or dental problems are unmasked. It is easy to blame methadone for these problems, when in fact they were pre-existing." These misunderstandings may cause some patients to request lower methadone doses or to stop methadone prematurely, says Dr. Fletcher.

The Bandwagon Effect

Dr. D'Aunno, along with colleagues at the University of Iowa in Iowa City and the Centers for Disease Control and Prevention in Atlanta, also evaluated treatment facilities' HIV prevention efforts, including HIV testing, counseling, and outreach. For this project, they used data collected from the sample of methadone treatment facilities plus other substance abuse treatment facilities for a total of 618 facilities.

As with the methadone treatment practices, the investigators found that the facilities had made substantial improvements in their HIV prevention efforts over the period from 1988 to 1995. In both 1988 and 1990, only 39 percent of the facilities provided HIV testing and counseling, but by 1995, 61 percent were providing these services. Also, 51 percent of the facilities in 1988 and 65 percent in 1990 were engaging in HIV outreach, but by 1995 this had increased to 75 percent.

The investigators found that the treatment facilities most likely to conduct HIV prevention activities were those that had more patients at high risk of HIV infection, more resources, and lower patient-to-staff ratios. Also, these facilities generally were publicly rather than privately funded and had clinical supervisors who supported HIV prevention practices.

Perhaps the most important factor in promoting HIV prevention practices, however, seemed to be pressure from people in the drug abuse treatment field. "When the HIV epidemic first started, many treatment facilities were uncertain how to react," says Dr. D'Aunno. "As some facilities began conducting HIV testing, counseling, and outreach, pressure began to mount for other facilities to do the same. This eventually created a bandwagon effect."

NIDA helped get the bandwagon going by supporting research programs in which scientists worked together with practitioners to develop effective HIV/AIDS outreach techniques, according to Dr. D'Aunno. "These programs set a good example for treatment providers," he says. "The providers saw local researchers and other providers working together on HIV prevention, and they decided to follow their lead."

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NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 14, Number 6 (March 2000)

Recovery Harder for Addicts Who Start Young

A NIDA-funded study has demonstrated that the relapse rate for heroin addicts increases with time and that the probability of long-run abstinence depends on the age of first drug use. Those who start daily heroin use at a younger age are more likely to relapse than those who start later.

The study, conducted by Dr. Marnik G. Dekimpe of the Catholic University Leuven in Belgium and his colleagues in Belgium and at the University of California, Los Angeles, examined the treatment histories of 846 patients at methadone clinics in central and southern California. The researchers looked at males and females, whites and Chicanos, most of whom started using heroin between the ages of 17 and 25. Subjects were interviewed over a 4-year period during and after treatment to determine the probability of their relapse to heroin use.

The finding that relapse is connected to time suggests the need for long-term periodic monitoring of a former heroin user's abstinence, Dr. Dekimpe says. The researchers also found drug relapse odds were significantly different across the sociodemographic groups studied, suggesting that prevention resources could be directed to groups at higher risk. No significant differences in relapse probability were associated with either gender or education. NN

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Research Findings

Volume 14, Number 5 (December 1999)

High-Dose Methadone Improves Treatment Outcomes

By Patrick Zickler, *NIDA NOTES* Staff Writer

Methadone has been used effectively for more than 30 years as a treatment for heroin addiction. The medication blocks heroin's narcotic effects without creating a drug "high," eliminates withdrawal symptoms, and relieves the craving associated with addiction. Methadone is administered orally in licensed clinics and its effects typically last 24 to 36 hours.

Although methadone has been used for decades, no clinical consensus has been reached about the most effective daily dose. Many clinics do not adjust dosages according to the needs of individual patients. Instead, they administer fixed doses. One clinic might use doses of 25 milligrams (mg) per day for all patients; others may administer daily doses of 60 mg. "Federal regulations require that a clinic receive a special exemption in order to provide patients with doses greater than 100 mg per day, but no contemporary studies have examined the effectiveness of daily doses greater than 80 mg," says Dr. Eric Strain, a NIDA-supported researcher at The Johns Hopkins University Medical Center in Baltimore.

Dr. Strain and his colleagues investigated the effectiveness of high-dose—80 to 100 mg per day—methadone treatment and found this dosage to be more effective in reducing heroin use than treatment with a moderate dose of 40 to 50 mg per day. The study involved 192 patients. Sixty-five percent of participants were male; pregnant women were excluded from the study group.

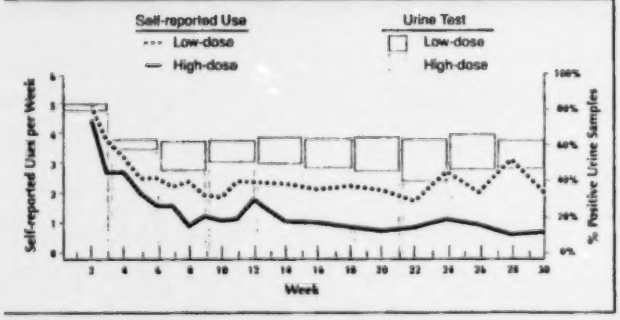
During the first week of treatment all patients received 30-mg daily methadone doses. Daily doses were increased until, by the 8th week, half the patients were receiving a moderate dose of 40 to 50 mg per day and the other half were receiving a high dose of 80-to-100 mg per day. These doses were maintained through the study's 30th week. Dosages were then decreased by 10 percent each week during the final 10 weeks of the program. Patients were encouraged to enroll in long-term community-based treatment programs following completion of the 40-week study.

Dr. Strain and his colleagues evaluated the effectiveness of treatment through analysis of twice-weekly observed urine testing, weekly patient reports of heroin use, and the length of time patients remained in treatment. "The high-dose group used opiates significantly less during treatment than did the moderate-dose group on average," Dr. Strain says. "Patients in the high-dose group reported using opiates no more than once a week. The moderate-dose group reported using drugs two to three times per week on average." Among patients who completed the 30-week active phase, 33 percent of high-dose patients remained in treatment throughout a 10-week methadone phase-out, compared with 20 percent of moderate-dose patients. There were no gender-related differences in outcome for high- or moderate-dose groups, and no difference was reported between the high- and moderate-dose patients for side effects such as grogginess or constipation.

In an earlier study, the researchers found that moderate-dose treatment of 50 mg per day was more effective than low-dose treatment of 20 mg per day. "The current study provides strong evidence that we can achieve much better outcomes at dose rates much higher than 50 mg per day," Dr. Strain says.

Dosages exceeding the currently regulated ceiling of 100 mg per day may provide the best result for some patients, Dr. Strain says, but he notes that clinical trials would be needed to support changing this regulation. "The most important aspect of our research from a therapeutic and public health perspective is that methadone treatment over a broad range of doses results in significant clinical improvement for opioid-addicted patients," he says.

Patients Receiving High-Dose Methadone Treatment Used Drugs Less Often Than Those Receiving Moderate-Dose Treatment



Following a 1-week orientation period, patients receiving high-dose (80-100 mg) methadone treatment had less self-reported heroin use and lower rates of drug-positive urine samples than patients on moderate-dose (40-50 mg) treatment. Urine results are shown as 3-week averages of twice-weekly samples.

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NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 14, Number 2 (August 1999)

Heroin Snorters Risk Transition To Injection Drug Use and Infectious Disease

By Robert Mathias, *NIDA NOTES* Staff Writer

Heroin users who think they can avoid the harmful consequences of drug injection by snorting or smoking the drug may be dangerously mistaken. A NIDA-funded study indicates that noninjecting heroin users (NIUs) are at considerable risk of becoming drug injectors, thereby incurring risks for HIV, hepatitis, and other serious diseases. Moreover, regardless of whether they go on to inject drugs, a significant number contract hepatitis, the study shows.

"Becoming a drug injector is not inevitable for heroin snorters who have never injected drugs, but the risk of making the transition to injection drug use is fairly substantial," says Dr. Alan Neaigus of National Development and Research Institutes (NDRI), Inc., in New York City. Dr. Neaigus and his colleagues at NDRI have been examining rates of transition to injection drug use and disease incidence among 560 NIUs recruited from March 1996 through April 1998. The study group consists of heroin users who have never injected drugs and former heroin injectors who had not injected drugs for at least 6 months prior to the study. Data from followup interviews conducted with 331 study participants show that more than 15 percent transitioned to drug injection during an average period of a little more than a year. The researchers found no significant difference in the transition rate between NIUs who had never injected heroin and the 31 percent of the study group who were former injectors.

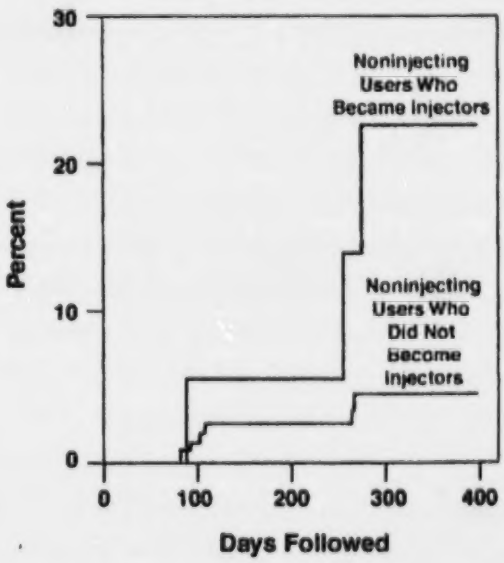
Previous studies have found higher rates of transition from noninjection to injection drug use, particularly among former injectors. However, Dr. Neagius says a number of factors may now be slowing the rate at which heroin snorters are initiating or resuming injection of the drug. First, a dramatic increase in the purity of heroin during the 1990s has made it possible for snorters to achieve a high that is similar to what they can obtain from injection. Second, greater awareness of the risk of contracting AIDS from injecting drugs may be dissuading more users from the practice.

The NIU study supported earlier research findings that NIUs who socialize, use drugs, or have sex with IDUs significantly increase their risk of crossing the line from snorting to injecting drugs. Preliminary analysis further suggests that being in the presence of an IDU who is injecting drugs may play an important role both in the initiation and resumption of injection drug use, Dr. Neaigus says. This finding suggests that the direct transfer of information and techniques used to inject drugs may be an important factor in the transition to injection drug use.

> ***"This is the era of AIDS, and everyone knows about the risks from needles. When you sniff, you don't have to worry about AIDS."***
>
> **Noninjecting heroin user interviewed in New York City**

The level of heroin addiction is another major factor in the transition to injection. The NIU study participants' levels of addiction ranged from snorting heroin occasionally on weekends through using several bags a day,

Hepatitis C Among Noninjecting Heroin Users



Drug injection is the primary mode of hepatitis C transmission. In a New York City study, a large percentage of noninjecting heroin users who transitioned to injection drug use contracted the disease.

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NIUs who socialize, use drugs, or have sex with IDUs significantly increase their risk of crossing the line from snorting to injecting drugs.

Dr. Neaigus says. Previous research has suggested that even with the availability of high-purity heroin, more heavily addicted heroin snorters may turn to drug injection because it remains a more effective way to take the drug. For example, in a study conducted between 1991 and 1993 by Dr. Samuel R. Friedman, also of NDRI, 30 percent of 755 IDUs in Brooklyn, New York, reported they started to inject to get a better high.

NIUs and Infectious Disease

The health risks associated with noninjecting heroin use are substantial, both for NIUs who become IDUs and for those who don't, the study found. All study participants received counseling about the risks of drug injection, hepatitis, and HIV. Nevertheless, almost 23 percent of the NIUs who began to inject drugs contracted hepatitis C (HCV) over the average followup period of a little over a year. HCV leads to chronic liver infection in about 80 percent of patients, most of whom eventually develop fatal liver diseases such as cirrhosis and liver cancer, says Dr. Henry Francis, who directs NIDA's Center on AIDS and Other Medical Consequences of Drug Abuse.

Because injection drug use is the primary mode of HCV transmission, "the rapid rate of transmission of hepatitis C among NIUs who initiate or resume injecting was expected," Dr. Neaigus says. "However, it is still alarming," he adds. What was unexpected was that some NIUs who did not begin to inject drugs—about 4 percent—also contracted HCV during the followup period. NDRI researchers now are attempting to determine how these NIUs contracted the infection, Dr. Neaigus says.

NIUs who did not transition to injection drug use were also at substantial risk of becoming infected with hepatitis B (HBV), the study shows. About 9.5 percent contracted HBV during the followup period. Though it receives less attention than HCV, HBV can develop into chronic infection and serious liver disease in up to 20 percent of cases, says NIDA's Dr. Francis.

The considerable amount of HBV found among NIUs, particularly among those who have never injected, reflects substantial sexual transmission of this disease, Dr. Neaigus says. Though the study only measured sexual activity over a 30-day period, "we found a lot of sexual risk in this group," he says. For example, about 70 percent of NIUs were sexually active during this period with two-thirds of them engaging in unprotected sex, many with partners who had HIV or were IDUs, says Dr. Neaigus.

To date, the study has not found any new cases of HIV either among NIUs who began injecting drugs or among those who did not. However, Dr. Neaigus says that the high rates of new HBV and HCV infections found among NIUs may serve as markers for sexual behaviors and drug injection practices that continue to put NIUs at risk for infection with HIV. In addition to finding extensive high-risk sexual activity among NIUs, the study found NIUs who had recently transitioned to injection drug use commonly shared injection equipment, such as cookers, cotton, and rinse water. However, they infrequently shared syringes and over half obtained all their syringes from syringe exchange programs.

Noninjection drug use is two-edged in its effect on heroin users' risk of contracting infectious diseases, Dr. Neaigus concludes. On the one hand, the considerable numbers of former IDUs who are now snorting heroin instead of injecting it have reduced their risk of AIDS and HCV considerably. On the other hand, NIUs who have never used heroin before have increased their risk of heroin addiction, transition to injection drug use, and contracting HIV, HCV, and HBV.

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NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 13, Number 5 (February 1999)

Heroin, Marijuana, Methamphetamine Use On the Rise

Cocaine use appears to have leveled off, but use of heroin, marijuana, and methamphetamine is on the increase, according to data reported at the June 1998 meeting of the Community Epidemiology Work Group (CEWG). CEWG is a NIDA-supported network of researchers from 21 U.S. metropolitan areas who review drug abuse data and evaluate information compiled from local, city, State, and Federal sources. Major indicators of drug abuse monitored by CEWG include drug-related deaths and emergency room admissions, drug abuse treatment admissions, and drug-positive urinalysis results in persons arrested.

- **Cocaine.** While abuse of crack cocaine remains the Nation's predominant illicit drug problem, data show a continued leveling off of use in many urban areas. Indicators of cocaine use declined in 16 of the 21 CEWG areas.
- **Heroin.** Indicators of heroin use increased in 16 of the 21 CEWG areas. Intranasal heroin abuse, or "snorting," has become increasingly popular. Data from several cities show increases in use among youth and young adults. The suburbs are increasingly mentioned, with young white professionals, laborers, and high school students from the suburbs noticed in the inner cities buying drugs.
- **Methamphetamine.** Indicators of methamphetamine use increased in 8 of the 21 CEWG areas, including 4 areas where methamphetamine use previously had been stable or in decline. Smoking the drug has become popular in some cities, but injection remains the predominant method of use.
- **Marijuana.** Indicators of marijuana use increased in 15 of the 21 CEWG areas, primarily among youth. Alcohol remains the most popular secondary drug reported with marijuana use, but other drug combinations also continue to be reported. Marijuana cigarettes are sometimes combined with cocaine, methamphetamine, phencyclidine (PCP), embalming fluid, or codeine cough syrup, according to reports from various CEWG cities. NN

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Research Findings

Volume 13, Number 3 (July 1998)

Linking Medical Care With Drug Abuse Treatment Stems Tuberculosis Among HIV-Infected Drug Users

By Robert Mathias, *NIDA NOTES* Staff Writer

Injecting drug users with HIV/AIDS can be treated successfully for tuberculosis (TB) in methadone treatment programs that provide comprehensive medical care, according to NIDA-supported research. Integrating medical care and drug abuse treatment also has been effective in preventing new cases of TB from developing among HIV-positive patients, the research indicates.

"A key to dealing successfully with infectious diseases, such as TB and HIV, among drug abuse patients is the linkage of primary care and drug abuse treatment in a drug abuse treatment setting," says Dr. Paul A. Coulis of NIDA's Center on AIDS and Other Medical Consequences of Drug Abuse. "In places where this has been done, such as New York City, it has been effective, so we know it works," he says.

TB is a chronic and infectious lung disease. People with latent tuberculosis infection do not have symptoms, may not develop active disease, and cannot spread TB. However, if such individuals do not receive preventive therapy, they may develop active TB, which is contagious.

Research has shown that injecting drug users have high rates of latent tuberculosis infection. NIDA-supported studies among injecting drug users have shown that HIV can activate this latent TB infection and increase the risk that active TB will develop. In New York City, which was hard hit by the linked epidemics of HIV and TB during the mid-1980s and early 1990s, 30 percent of persons with active TB were injecting drug users, according to the Centers for Disease Control and Prevention (CDC).

Rates of TB have declined both nationally and in New York City since 1992. However, injecting drug users continue to be at high risk for HIV and tuberculosis. For example, about one-third of the 900 methadone treatment patients in the Montefiore Medical Center's Substance Abuse Treatment Program in The Bronx, New York, have HIV, and TB rates are much higher than they are in the general population, says Dr. Marc Gourevitch, who directs a NIDA-funded study of TB infection in drug users enrolled in the program. "Almost all the active TB cases we see among drug users in our program are among those who are HIV-positive," Dr. Gourevitch notes.

To respond to the complex health needs of its patients, the Montefiore treatment program used funding from NIDA and the Health Resources and Services Administration to begin providing medical care on site along with methadone treatment in 1989. In addition to general and HIV-related primary care, on-site services now include mental health and social support services; HIV testing and counseling; and TB testing, prevention, and treatment.

"Our model has been to build comprehensive primary care services into the same site at which people are receiving their drug treatment to make it easier for them to get their medical care," Dr. Gourevitch says. This treatment model has enabled the program to achieve excellent success in getting drug abuse treatment patients to complete the full course of TB therapy needed to curtail the spread of the disease, he says.

Patients must follow demanding medication regimens to prevent and treat TB. To complete the full course of TB prevention, injecting drug users with latent TB infection must take one medication, isoniazid, daily for up to a year. Patients with active tuberculosis require an initial hospitalization with a 4-medication regimen and then must take 2 to 4 medications daily or several times a week for up to a year. Failure to complete the full course of TB treatment can spawn an even more deadly form of the disease, one that is resistant to tuberculosis medications.

In 1989, the Montefiore treatment program implemented a strategy called directly observed therapy (DOT) that was designed to increase patients' adherence to TB therapy. With DOT, treatment personnel observe patients taking each dose of their TB prevention and treatment medications. Now a widely accepted TB treatment practice, DOT, along with improved management of TB cases to ensure completion of a full course of therapy, has been credited by the CDC as playing a major role in the overall reduction in TB rates in the United States since 1992 (see "The Rise and Fall of TB in the United States."). Methadone treatment programs offer an ideal setting to implement DOT and ensure that injecting drug users complete the full course of treatment because patients are coming in daily for their methadone anyway, Dr. Gourevitch says. "It's a natural process to administer the

anti-TB medications and methadone at the same time under direct supervision," he says.

Directly observed tuberculosis prevention and treatment are voluntary at Montefiore. No incentives are offered for participating in supervised preventive therapy, and methadone is not withheld if drug abuse treatment patients do not accept TB therapy. "Yet, almost everyone opts for observed therapy because it eliminates the hassle of having to remember to take TB medications at other times of the day," Dr. Gourevitch says.

Research conducted by Dr. Gourevitch shows that a high percentage of patients receiving directly observed prophylaxis and treatment in the context of their methadone treatment adhere to and complete TB therapy. In one study, more than 80 percent of 114 eligible patients had completed or were still receiving prophylaxis or treatment at the end of a 2-year period. Additional research by Dr. Gourevitch indicates that completion of TB prophylaxis was associated with a 75-percent reduction in the TB rate in this high-risk population and that providing on-site directly observed prophylaxis is cost-effective in terms of preventing the costs of treating active TB.

"What we've learned is that having primary care integrated with drug abuse treatment is a very effective way to treat and prevent various diseases among drug users," concludes NIDA's Dr. Coulis.

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NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 12, Number 6 (November/December 1997)

NIH Panel Calls for Expanded Methadone Treatment for Heroin Addiction

By Robert Mathias, *NIDA NOTES* Staff Writer

An expert panel at a National Institutes of Health (NIH) Consensus Development Conference on Effective Medical Treatment of Heroin Addiction has concluded that heroin addiction is a medical disorder that can be effectively treated in methadone treatment programs. The consensus panel strongly recommended expanding access to methadone treatment by eliminating excessive Federal and State regulations and increasing funding for methadone treatment. The conference, which was cosponsored by NIDA, along with the NIH Office of Medical Applications of Research and the NIH Office of Research on Women's Health, was held in Bethesda, Maryland, last November.

Methadone is the medication used most frequently to treat heroin addiction. Outpatient methadone treatment programs administer methadone to reduce patients' cravings for heroin and block its effects, thereby enabling patients to lead productive lives. These programs also may provide counseling, develop vocational skills, and/or provide psychosocial and medical support services to rehabilitate patients. Some patients stay on metha done indefinitely, while others move from methadone to abstinence.

NIH consensus conferences constitute a science forum where a panel of independent nongovernment experts examines the scientific evidence and makes recommendations on an area of medicine. During the course of the conference on treating heroin addiction, the consensus panel, chaired by Dr. Lewis L. Judd of the University of California at San Diego School of Medicine, focused on determining the effectiveness of methadone treatment. After conducting a thorough review of the accumulated data and listening to expert testimony and public debate on the issues, the panel stated unequivocally that addiction to opiate drugs such as heroin is a disease of the brain and a medical disorder that can be effectively treated. Methadone treatment significantly lowers illicit opiate drug use, reduces opiate-related illness and death, reduces crime, and enhances social productivity, the panel concluded.

Despite methadone's effectiveness, less than 20 percent of the estimated 600,000 heroin addicts in the United States are being treated in methadone treatment programs, the panel noted. Many barriers limit the availability of methadone treatment.

These barriers include unnecessary laws administered by a number of Federal agencies and many State and local governments that burden treatment programs with excessive regulatory requirements and duplicative inspections. Some of these regulations restrict treatment programs' ability to tailor methadone doses to the needs of individual patients. Other regulations require physicians to obtain a special Federal registration to use methadone to treat narcotic addiction, thus limiting the number of physicians who are available to treat heroin addiction. Wider use of methadone treatment also is restricted by a shortage of physicians and other health care professionals who are trained to treat heroin addiction, and inadequate funding to provide methadone treatment slots for all those who require them.

The Recommendations

The panel recommended a number of steps to improve access to methadone treatment for all people addicted to heroin and other opiate drugs. The panel's recommendations include the following:

- eliminating unnecessary layers of Federal and State regulation for methadone and similar opiate treatment medications;
- instituting means other than regulation to improve the quality of methadone treatment, such as accreditation of methadone treatment programs;
- improving the training that physicians and other health care professionals receive in the diagnosis and treatment of patients with heroin addiction; and
- increasing funding for methadone treatment, including providing benefits for methadone treatment as part of public and private health insurance programs.

The panel also recommended that additional research be conducted on factors that lead to heroin use; changes in the brain that occur with repeated heroin use and result in addiction; the neurobiological processes of craving; and the differences among individuals who are able to end opiate addiction and those who cannot. In addition, the panel called for a national study to assess the prevalence of heroin addiction in the United States and for rigorous studies of the financial costs of heroin addiction to society and the cost-effectiveness of methadone treatment. NN

NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 12, Number 6 (November/December 1997)

NIDA Conference Aims "Preemptive Strike" at Increased Heroin Use Among Nation's Young People

By Robert Mathias, *NIDA NOTES* Staff Writer

In response to an upsurge in heroin use among America's young people in recent years, NIDA convened a national research-based conference on Heroin Use and Addiction in Washington, D.C., this past September. The well-attended conference drew more than 600 participants who examined all aspects of the changing nature of heroin use in the United States and shared scientific information and approaches to preventing and treating heroin abuse and addiction. Representatives of national drug abuse organizations, scientists, prevention and treatment practitioners, and criminal justice personnel took part in the conference.

In his opening remarks, NIDA Director Dr. Alan I. Leshner cited figures from national drug abuse surveys and surveillance systems that show heroin use increasing during the 1990s, particularly among people ranging in age from 12 to 26. "Today, we are launching a preemptive strike to halt this trend before it can become a crisis," Dr. Leshner said. His call to action was echoed by Health and Human Services Secretary Dr. Donna E. Shalala and by General Barry McCaffrey, director of the White House Office of National Drug Control Policy, in their keynote speeches.

The proliferation of cheap, high-purity heroin during the 1990s has played an important role in the increase in heroin use among young people, a number of researchers reported at the conference. In the early 1980s, the purity of heroin on New York City streets was about 5 percent, according to Dr. Marian Fischman of Columbia

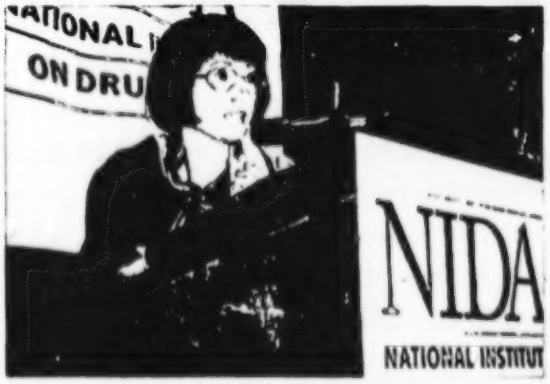
At NIDA's heroin conference, NIDA Director Dr. Alan I. Leshner, left, talks with Dr. Avram Goldstein of Stanford University, center, and Dr. Eric Nestler of Yale University School of Medicine.

Meeting participants review informational materials on heroin abuse, prevention, and treatment that were distributed throughout the conference.

University School of Medicine in New York. In 1996, the Drug Enforcement Administration estimated that heroin purity ranged from 68 percent to 80 percent, Dr. Fischman said. High-purity heroin enables users to get high by snorting and smoking the drug instead of injecting it, Dr. Fischman said, noting, "This ability to use heroin without injecting it makes it more attractive and less frightening to the user."

Many young people have a naive belief that because they are snorting or smoking heroin and not injecting it, their heroin use is not addictive, Dr. Leshner said. This is a dangerous misconception, he said. Clinical studies show that "heroin taken by the intranasal route is a potent reinforcer, and physical dependence occurs with repeated use," Dr. Fischman noted. As a heroin user becomes addicted to heroin, tolerance develops and more drug must be taken to achieve the same effect. Thus, there is a real risk that people who snort heroin will progress to injection, which is the fastest and most efficient way to take the drug, Dr. Fischman said.

For heroin users, behavioral, social, and health consequences multiply over time. Data from a long-term study of Vietnam War veterans show that "those who used heroin in Vietnam are at significantly higher risk for other substance abuse, post-traumatic stress disorder, suicidal behaviors, and premature death later in their lives than



Dr. Rumi Kato Price of Washington University School of Medicine details some of the harmful consequences of heroin use.

those who did not use heroin during their tours," said the study's principal investigator, Dr. Rumi Kato Price of Washington University School of Medicine in St. Louis, Missouri. Additional possible health consequences of heroin injection chronicled in other presentations include acute and fatal overdose; bacterial infections including infection of the heart lining and valves; fungal infections; blood-borne viral diseases, particularly HIV/AIDS and hepatitis B and C; and tuberculosis.

Heroin Addiction and Treatment

Some of the known neurobiological processes through which heroin use becomes addictive were explained by Dr. Avram Goldstein of Stanford University in Palo Alto, California, and by Dr. Eric Nestler of Yale University School of Medicine in New Haven, Connecticut. With repeated heroin use, extensive changes occur in brain neurons and pathways that are critical to experiencing pleasure and reward, they noted. These alterations in the brain short-circuit the user's ability to experience normal pleasures and create a need for more drugs, explained Dr. Nestler. "These changes play an important role in craving and relapse," he said.

A number of pharmacological and behavioral treatments can address the changes in the brain and behavior that occur with heroin addiction, several researchers noted. "Both methadone and LAAM (levo-alpha-acetylmethadol) are highly effective medications for treating heroin addiction," Dr. Goldstein said. Though neither medication is a cure, both work to stabilize the brain's reward system, suppress heroin withdrawal symptoms, and relieve craving, enabling patients in treatment to function normally, he said.

One of the pioneering scientists in early methadone treatment studies, Dr. Mary Jeanne Kreek of The Rockefeller University in New York, said that more than 30 years of research have demonstrated that methadone is safe and effective in treating heroin addiction and reducing its harmful consequences. Reductions in injecting drug use and needle sharing along with lower incidence of HIV infection are all associated with being in methadone treatment, noted Dr. Kreek and other researchers. Methadone treatment for heroin-dependent pregnant women also reduces morbidity and mortality among addicted mothers and their newborn infants, said Dr. Karol Kaltenbach of Jefferson Medical College in Philadelphia.

In addition to medications, behavioral therapies in residential and outpatient settings play an important role in treating heroin addiction, according to a number of presentations. One effective cognitive-behavioral approach cited is long-term treatment in a residential community of counselors and fellow recovering addicts, often referred to as a therapeutic community. Other promising cognitive-behavioral approaches include contingency management, which offers incentives to patients for staying drug free, and relapse prevention strategies that modify patients' thinking and behaviors and increase their coping skills to deal with difficult situations.

Combining such behavioral therapies with pharmacotherapy to meet the needs of individual patients results in the most effective treatment, a number of speakers said. In addition, controlled studies show that adding appropriate psychosocial services, such as employment counseling, psychotherapy, and family therapy, to methadone treatment increases its effectiveness, noted Dr. A. Thomas McLellan of the University of Pennsylvania in Philadelphia.

Several presentations featured programs that can prevent heroin use and addiction. Two family-based programs, the Strengthening Families Program and the Focus on Families Program, have been effective in reducing risks of drug abuse among children at risk of drug abuse. (For more information on these prevention programs, see "Children on the Brink: Youths at Risk of Drug Abuse," V12-3, May/June 1997) NN

NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 12, Number 6 (November/December 1997)

Applying Scientific Research Can Counter Rise in Heroin Use

By NIDA Director Dr. Alan I. Leshner

NIDA has launched what we hope will be a successful preemptive strike using the full power of science to stop a troubling spread of heroin use among our Nation's youth. The strike began in full force at NIDA's National Conference on Heroin Use and Addiction this past September, building on many activities that long have been under way.

During the past 5 years, NIDA's early drug abuse warning systems and a number of national surveys have shown that younger and wider segments of the population are abusing heroin. Most of the estimated 141,000 new heroin users in 1995 were under the age of 26, according to the National Household Study on Drug Abuse. And, from 1991 to 1996, the percentage of the Nation's 8th, 10th, and 12th graders who used heroin in the past year rose substantially, according to NIDA's 1997 Monitoring the Future study. The good news is that heroin use remained stable in 1997, the study indicates.

NIDA research has given us a variety of tools that we can use to treat heroin addiction and address this public health challenge.

New drug trafficking patterns, increased purity, and decreased price may all have contributed to this increasing trend in heroin use. Our research also indicates that a change in the way heroin is used may have attracted a new population of young users. Some of these young users are snorting and sniffing the drug and wrongly believe that if they don't inject heroin they won't become addicted to it. However, repeated use of heroin by any method induces neurobiological changes that trap the user in a downward spiral of addiction. The consequences of this addiction can include violence and criminal acts, HIV/AIDS, hepatitis, tuberculosis, and even death from overdose or medical complications.

Fortunately, NIDA-funded research has given us many means to address this problem. Our research has yielded a tremendous amount of knowledge about the true nature of addiction as a chronic brain disease that results from prolonged drug use. Most importantly, this research also has given us a variety of tools that we can use to treat heroin addiction and address this public health challenge. This research also has developed effective prevention programs that can reduce the risk of heroin use among children.

The most important task in drug abuse treatment is to match the treatment approach to the individual needs of the patient. Behavioral and pharmacological treatments each help restore a degree of normalcy to brain function and behavior that have been disrupted during the addiction process. Ultimately, however, integrating both types of treatment will provide the most effective approach.

Effective research-based behavioral treatment approaches for heroin addiction include long-term treatment in residential therapeutic communities and outpatient treatment programs. Over the years, NIDA has developed a broad array of effective interventions that can be used in these treatment settings. Cognitive-behavioral interventions modify patients' thinking and behaviors and increase their coping skills to enable them to deal with difficult situations without resorting to drugs. Contingency management therapy uses a voucher-based system where patients earn "points" based on negative drug tests, which they can exchange for items that encourage healthy living.

Because behavioral treatments are so important in countering heroin and other drug abuse, developing new behavioral treatments and speeding their way into clinical practice are major goals of NIDA's Treatment Initiative. The Initiative, which is working to improve the quality of the Nation's drug abuse treatment, will showcase effective behavioral treatments at NIDA's National Conference on Drug Addiction Treatment Research. The conference will be held in Washington, D.C., on April 8 and 9, 1998. (See "NIDA Launches Drug Abuse Treatment Initiative," V12-4, July/August 1997.)

As I noted above, it is when behavioral therapies are integrated with pharmacological treatments that we get the best heroin treatment results. Pharmacological treatments

include the most widely used medication for heroin addiction, methadone, and LAAM (leva-alpha-acetyl-methadol), a newer medication developed by NIDA as an alternative to methadone. Both medications reduce drug use, normalize brain and physiological functions disrupted by heroin addiction, reduce mortality and disease associated with drug abuse, and enable heroin-addicted patients to live productive lives.

To provide practitioners with additional options for treating heroin addiction, NIDA's Medications Development Division (MDD) continues to work on new compounds. For example, one promising heroin treatment medication, buprenorphine, may become the first-line therapy for the newly addicted patient. Data from clinical trials suggest buprenorphine is very safe and has few side effects or withdrawal symptoms. As additional heroin treatment medications become available, we will be better able to vary medications and doses to meet the individual needs of patients at different stages of treatment.

A critical component of NIDA's preemptive strike is disseminating the scientific knowledge and the drug abuse prevention and treatment tools we have developed to people working to address the problem in the community. For example, NIDA held a national research-based conference on heroin use and addiction in September in Washington, D.C. At the conference, more than 600 scientists, practitioners, policymakers, representatives of constituency groups, and criminal justice personnel from around the Nation shared information about changing trends in heroin use, the devastating costs of heroin addiction, and how communities can prevent and treat heroin abuse. (See "NIDA Conference Aims 'Preemptive Strike' at Increased Heroin Use Among Nation's Young People.")

To address barriers to the clinical use of effective treatments for heroin addiction, NIDA, the National Institutes of Health (NIH) Office of Medical Applications of Research, and the NIH Office of Research on Women's Health cosponsored an NIH Consensus Development Conference on Effective Medical Treatment of Heroin Addiction in November in Bethesda, Maryland. Following a thorough review of the accumulated evidence, an independent panel of nongovernment experts concluded that methadone treatment significantly lowers heroin and other illicit opiate drug use, reduces opiate-related illness and death, reduces crime, and enhances social productivity. The panel strongly recommended broader access to methadone treatment programs for people who are addicted to heroin and other opiate drugs. (See "NIH Panel Calls for Expanded Methadone Treatment for Heroin Addiction.")

Finally, to arm the general public, policymakers, health care practitioners, and prevention and treatment service providers with the scientific facts about heroin, NIDA has developed a new research report, Heroin Abuse and Addiction, which provides an overview of the latest research findings on heroin.

The signs of increased heroin use we have seen, especially among the young, are a warning signal to the drug abuse research, prevention, and treatment communities. NIDA has heeded that warning. By intensifying our drug abuse treatment research and increasing our dissemination of the research-based facts about heroin abuse and addiction, NIDA is providing the knowledge and tools that practitioners and communities can use to prevent heroin use and treat the destructive disease of heroin addiction.

For More Information

The NIDA research report, Heroin Abuse and Addiction (NCADI publication #PHD742), can be obtained from the National Clearinghouse for Alcohol and Drug Information, P.O. Box 2345, Rockville, MD 20847-2345, 1-800-729-6686.

This publication and additional information about heroin abuse and addiction also can be obtained from this web site. Information about heroin abuse and addiction can also be found on NIDA's new Infofax (online soon)

The NIH consensus development conference statement on Effective Medical Treatment of Heroin Addiction is available by calling 1-888-644-2667.

The statement can also be downloaded from the NIH Consensus Development Program World Wide Web site at http://consensus.nih.gov/. NN

NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 12, Number 2 (March/April 1997)

Rate and Duration of Drug Activity Play Major Roles in Drug Abuse, Addiction, and Treatment

By Robert Mathias, *NIDA NOTES* Staff Writer

When smoked or taken intravenously, cocaine produces a fast, intense high that dissipates quickly, creating a powerful need to take the drug again. In this regard, cocaine provides a perfect illustration of the critical role that a compound's rate and duration of action play in drug abuse and addiction.

Rate of Action

The rate at which a psycho-active drug occupies, or binds to, the brain sites called receptors for that drug determines the intensity of its rewarding effects and its abuse liability, according to a hypothesis discussed at several scientific forums by Drs. George Uhl and David Gorelick of NIDA's Division of Intramural Research (DIR) in Baltimore and Dr. Mary Jeanne Kreek of the Rockefeller University in New York. The faster a drug such as heroin or cocaine occupies enough brain receptors to produce a psychoactive effect, the greater the euphoria users experience, the more they "like" the drug, and the more liable they are to abuse it, according to this "rate hypothesis."

Conversely, the slower rate at which heroin treatment medications such as methadone and LAAM (l-alpha-acetyl-methadol) occupy the same receptors targeted by heroin may be a critical factor in their effectiveness in treating heroin addiction and their low abuse liability, according to these scientists. The fact that these slow-onset medications can be used to treat heroin, which has a fast rate of action, suggests that a compound that slowly occupies a sufficient number of the brain receptors targeted by cocaine might serve similarly and be effective in the treatment of cocaine addiction, the researchers say.

The faster a drug such as heroin or cocaine occupies enough brain receptors to produce a psychoactive effect, the greater the euphoria users experience, the more they "like" the drug, and the more liable they are to abuse it.

"The rapid rate at which brain receptors are occupied may play an underrecognized role in determining the euphoric effects of cocaine and heroin. The slower rate of occupancy of heroin-treatment medications may play an underappreciated role in their effectiveness in treating heroin

Why Does Rate of Action Affect the Brain?

What makes a faster-acting psychoactive drug produce more euphoria than a slower-acting one?

"The brain has many adaptive mechanisms, and if you disturb the brain slowly, it often can catch up or compensate," explains Dr. George Uhl, who directs the Molecular Neurobiology Branch of NIDA's Division of Intramural Research in Baltimore. "But, if you do things rapidly, often it can't." For example, going suddenly from a dark room into bright sunlight will result in a temporary loss of vision because the light sensitivity mechanisms of the eye and the brain cannot adapt that quickly, he says. But, if you proceed from dark to light slowly by stages, the mechanism works in a fairly automatic way, and you are able to see normally.

"If a drug acts slowly, the brain is able to compensate for the changes that the drug produces," says Dr. Uhl. However, when a drug's onset of action is very rapid, it may be able to overwhelm the brain's adaptive mechanisms, thus producing a bigger boost in its pleasure circuits, he says. Smoked and intravenous cocaine, for example, have fast rates of action. They reach the brain within seconds and rapidly flood the brain's "pleasure pathway" with excess dopamine, a brain chemical that helps transmit pleasurable feelings. If the brain's adaptive mechanisms cannot respond quickly enough to the sudden excess of dopamine, the euphoric rush ensues.

Method of Drug Administration Affects Rate of Action

The method of administering a drug can play a major role in the drug's rate of action, which in turn affects its abuse liability or potential as a treatment medication. Smoked drugs that are delivered through a "crack" pipe or a cigarette and injected drugs that are administered through a hyperdermic needle reach the brain very rapidly. This rapid action is an important factor in the strong effect and high abuse liability of such drugs. Drug abuse treatment medications, shown here in purple, are often administered orally or through a patch affixed to the skin and take longer to reach the brain. This slower rate of action is an important factor in the milder effect and low abuse liability of treatment medications.

addiction," says Dr. Uhl. Increasing evidence from various sources indicates that this concept offers "a promising, theory-based approach to developing a cocaine treatment medication," he says.

Alhough there is clinical evidence that fast-acting drugs can have more of a euphoric effect than slow-acting drugs have, "careful pharmacological studies demonstrating that different rates of cocaine and heroin administration produce different effects have been sparse," Dr. Uhl says. However, recent research is now providing additional support for the rate hypothesis, he says.

Smoked and intravenous cocaine act faster and produce greater euphoria than snorted cocaine, which in turn, acts faster and generates more euphoria than oral cocaine.

This research includes DIR animal studies that indicate that rapid infusion of cocaine and heroin produces greater reward than slower infusion does. In addition, DIR studies examining the effects of different methods of administering cocaine indicate that smoked and intravenous cocaine act faster and produce greater euphoria than snorted cocaine, which, in turn, acts faster and generates more euphoria than oral cocaine.

The link between the effect of a drug and its rate of receptor occupancy also has been buttressed in recent years by the cloning of the gene for the mu opiate receptor, the principal site in the brain where heroin works to produce its rewarding effects. Using the cloned mu opiate receptor, NIDA researchers have determined that opiate treatment medications such as methadone and LAAM work through the same receptor that heroin works through to produce euphoria. Previously, some researchers had suggested that because these medications produce effects that are so different from heroin's effects, they might work through different receptors than heroin does, says Dr. Uhl. Now, it appears that the dramatic difference in effects produced by the abused substance and its treatment medication stems from the fact that heroin occupies the receptors within seconds and produces a brief, intense "rush," whereas methadone occupies the same receptors much more slowly, producing only a very modest rewarding effect, he says.

While the fast rate at which cocaine acts on the brain plays a major role in its rewarding effects, it is cocaine's extremely rapid removal from the brain that both promotes and enables its frequent reuse and abuse.

Duration of Action

Duration of action, or how long the drug occupies a receptor once it gets there, also plays an important role in drug abuse and treatment. For example, cocaine has both a fast rate of action that produces euphoria and a rapid offset, or short duration of action, that allows frequent abuse.

Compounds with these traits may foster craving for more drug and stronger conditioning of the drug-taking habit, according to a hypothesis proposed by Dr. Nora Volkow of Brookhaven National Laboratory in Upton, New York. Brain imaging studies conducted by Dr. Volkow indicate that while the fast rate at which cocaine acts on the brain plays a major role in its rewarding effects, it is cocaine's extremely rapid removal from the brain that both promotes and enables its frequent reuse and abuse.

How Does Method of Administration Influence Rate of Action?

Many complex factors affect a compound's rate of action in the human body. These factors include the compound's structure and properties, how quickly the body absorbs it and transports it to the brain, and how rapidly it crosses the blood-brain barrier and binds to a sufficient number of targeted brain sites called receptors to produce its effects. Because the method of administering a drug affects a number of these factors, it can play a major role in the drug's rate of action and abuse liability.

By using different methods of administering a compound, scientists can slow its rate of action and produce milder effects that may substitute for the stronger effects of an abused substance. Such a compound may be an effective medication for patients in treatment.

The effect that method of administration has on rate of action may be best illustrated by the transdermal nicotine patch, which uses the abused substance itself—nicotine—to ease withdrawal symptoms and aid smoking cessation. However, unlike smoking a cigarette, which delivers an almost instantaneous burst of nicotine-laden blood to the brain, administering nicotine through a patch affixed to the skin slows its rate of action and produces more sustained, lower peak levels of nicotine in the blood. This lower, slower dose of nicotine has proven to be effective in short-term treatment of nicotine dependence and aiding smoking cessation.

Conversely, a long, sustained duration of action is important in determining the potential usefulness of a treatment compound, says Dr. Kreek. First, longer-lasting medications such as methadone are more practical because they can be given every 24 hours, whereas shorter-lasting medications require more frequent doses. Second, because their effects dissipate slowly, long-duration medications appear to be particularly useful in normalizing physiological functions such as regulation of hormonal activity and behaviors that have been disrupted by the rapid "on-off" effects produced by abused drugs, she says.

Clinical experience with both methadone and LAAM indicates that these medications have a much lower abuse potential than heroin has, Dr. Kreek says. They prevent withdrawal symptoms and reduce craving, thereby decreasing or eliminating heroin abuse. And they stabilize patients physiologically and psychologically, she points out. Once patients taking methadone have been stabilized at a therapeutically appropriate dose, "their behavior is essentially no different from that of any other healthy human being, and they are able to get an education or a job and improve their family relationships," she says.

Developing a Cocaine Treatment Medication

Several rate-based approaches to developing a potential cocaine treatment medication are possible, says Dr. Frank Vocci, acting director of NIDA's Medications Development Division. One approach is to search for compounds with a slower onset of action than cocaine that produce less euphoria and have a longer duration of action. Another is to design very slow onset compounds that would probably produce only subtle effects. To determine their treatment potential, compounds "that meet these parameters would need to be tested to see if they could block cocaine's effects and/or reduce chronic craving while they were active, Dr. Vocci says.

"We're starting to see some compounds now in our cocaine medication discovery program that have very slow onsets, days as opposed to minutes or hours, to reach peak levels," Dr. Vocci says.

Some of these compounds may enter the brain very slowly, but once they are there, they may hang onto the receptors for a long time. Others may be compounds that are slowly activated and gradually accumulate on brain receptors, he says. It is also possible to modulate a compound's onset of action pharmaceutically by manipulating its rate of absorption by the body with transdermal patches or controlled-release forms of administration, Dr. Vocci points out.

"We're starting to see some compounds now in our cocaine medication discovery program that have very slow onsets, days as opposed to minutes or hours, to reach peak levels."

To increase the potential usefulness of rate-based approaches in the development of a cocaine treatment medication, DIR and extramural researchers are attempting to answer basic questions about the rate at which cocaine brain receptor sites need to be occupied and the degree of occupancy that is required to either produce or

block cocaine's rewarding effects, Dr. Gorelick says. "At this point, we don't really know the minimum level of receptor occupancy we need to block cocaine's euphoria, but that information should come from ongoing studies," he says.

Once scientists have that information in hand, they can attempt to develop a compound that achieves the precise rate of action and degree of receptor occupancy that is needed to produce a milder effect and longer duration of action than cocaine. Such a compound, the rate hypothesis suggests, should be effective in reducing cocaine-seeking behavior and normalizing physiological functions that are disrupted by long-term cocaine abuse.

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NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 11, Number 3 (May/June 1996)

Vocational Screener Helps Methadone Patients Overcome Job Barriers

By Neil Swan, *NIDA NOTES* Staff Writer

Guidance in finding a job is a critical need for patients enrolled in methadone treatment programs for opiate addiction. Holding down a job is a step toward financial security, contributes to self-esteem and a healthier, happier lifestyle, and helps patients stay in treatment and drug free.

However, individuals in methadone treatment face serious obstacles to employment. These barriers include poor motivation that is often sparked by repeated failures in job-seeking efforts. Other common obstacles are lack of training or social support, appropriate tools or equipment, transportation, child care, health care, a driver's license, or clothing.

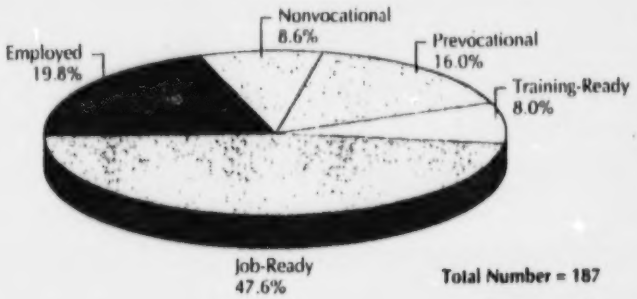
Many instruments exist for measuring treatment patients' skills, interests, and job abilities, but few assessment tools are available for determining whether patients are ready for vocational rehabilitation.

That's why NIDA grantees are testing a prototype Vocational Readiness Screener designed to quickly and reliably assess methadone treatment patients' employability and evaluate their vocational barriers and needs. While the testing was conducted in methadone programs, researchers believe many of the job-screening concepts could be used to assist patients in treatment for other forms of substance abuse.

The screener—a questionnaire that is completed by treatment patients in about 15 minutes—is a low-cost, rapid evaluation procedure suitable for routine use by vocational counselors in drug treatment programs, say its authors. It is easy to administer and interpret, says Dr. Michael L. Dennis, formerly of the Research Triangle Institute (RTI) in Research Triangle Park, North Carolina, who is principal investigator of the employability study.

"The Vocational Readiness Screener is a practical instrument to triage vocational services," says Georgia T. Karuntzos, an RTI researcher developing the screener. During triage, patients are first categorized by needs so counselors avoid wasting vocational services on those not currently prepared to receive them. Next, counselors allocate essential services to patients based on their individual needs, job readiness, or work status. The screener has been tested with two groups of methadone treatment patients. The questions, screening process, and interpretation and implementation procedures are being refined by the RTI researchers to improve the screener's validity and reliability.

Vocational Readiness of Methadone Patients Tested with the Screener



Employed: *Currently Works*

Job-Ready: *Wants a job and has a degree, a certificate, or a high school degree (GED) with at least 2 years work experience*

Training-Ready: *Wants school or training and has at least a GED*

Prevocational: *Does not want training or a job and does not have a GED*

Nonvocational: *Has an illness or disability that precludes vocational activity*

The screener asks for 96 responses to questions in 5 areas of vocational functioning:

- job status;
- level of motivation to get a job;
- level of social support from spouse, family, friends, or treatment counselors;
- ancillary needs such as transportation to work, medical care, uniforms or work equipment, or a driver's license; and
- barriers to work such as continued illicit drug use, a criminal record or criminal activities, health problems, or racial or gender discrimination.

The screener was most recently tested with 187 methadone treatment patients who volunteered to take part in a NIDA-funded Training and Employment Program (TEP) that was being implemented in treatment

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The screening process can easily be used by treatment providers as a starting point to place patients in training or job rehabilitation.

centers. TEP seeks cost-effective ways to train and find jobs for methadone patients. TEP patients who participated in the test of the screener had been in treatment for 3 or more months.

"Nearly half (47.6 percent) of the 187 methadone treatment patients who participated in the program gave answers showing that they have the appropriate skills and interests to get a job, but they often lack the necessary level of support or motivation, or they may have needs and barriers that must be addressed before they can get a job," says Dr. Dennis. "Our screener provides a practical way to quickly determine each client's job-related needs."

Researchers look at how patients' vocational status-either nonvocational, prevocational, training-ready, job-ready, or employed-is related to five employability dimensions that are measured by job needs or barriers and levels of support or motivation (see figure on previous page). For example, a patient classified job-ready but lacking transportation to work would receive help in finding transportation; another deemed prevocational but lacking motivation would be counseled and encouraged to seek out and enroll in an appropriate training program. "Determining vocational status, in conjunction with other dimensions of our screening framework, provides a comprehensive profile of employability," explains Ms. Karuntzos.

The screening process can easily be used by treatment providers as a starting point to place patients in training or job rehabilitation efforts appropriate to their specific needs.

"Using this screener, we find that gender, race or ethnicity, and age are important predictors of the job-finding needs of clients," says Ms. Karuntzos.

For example, females are more likely than males to want help with child care while in treatment, other research with methadone patients shows. Other measures of job readiness, such as specific needs and barriers to employment, are identified by using checklists in the screener.

Overzealous attempts to push unready people into jobs can backfire, Dr. Dennis warns, provoking "learned helplessness" when patients feel increasingly powerless in job-seeking efforts after repeated rejections.

"Nearly half of these clients are job-ready, but you need to identify and address the barriers they face to getting a job," he says. "If you push people with these very real barriers into unrealistic job-search struggles, it only increases frustration and undermines what motivation they may have."

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NIDA NATIONAL INSTITUTE ON DRUG ABUSE

Research Findings

Volume 10, Number 4 (July/August 1995)

Heroin Update: Smoking, Injecting Cause Similar Effects; Usage Patterns May be Shifting

By John A. Bowersox, *NIDA NOTES* Contributing Writer

Although the current epidemic of cocaine use has commanded more attention, heroin use remains a serious problem in the United States. For example, the number of hospital emergency department visits related to the use of heroin rose from 38,100 in 1988 to 63,000 in 1993, an increase of 65 percent. In addition, some researchers have noted that snorting and smoking heroin may be growing in popularity as alternatives to injecting the drug.

In a recent study, NIDA researchers confirmed that the addictive effects of heroin can be obtained by smoking the drug, although smoking is a less efficient route of administration than injecting. The findings might help explain anecdotal reports of heroin smoking among users in some large cities in the United States.

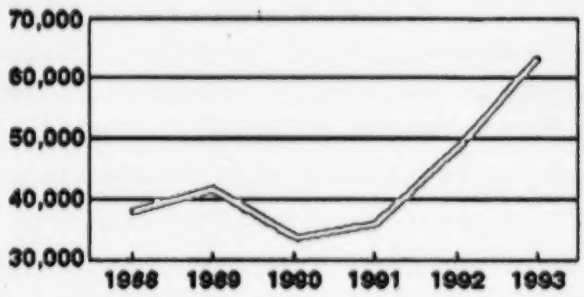
In the study, scientists in NIDA's Division of Intramural Research (DIR) at the Addiction Research Center in Baltimore gave heroin to human volunteers via a computer-controlled smoking device that delivered precise doses of the drug. The effects of four separate doses of smoked heroin were compared to those produced by four intravenous doses of heroin.

"The effects were similar but not equal on a gram-to-gram basis," says Dr. Edward Cone, who headed the study. By either route, heroin was detected in the subjects' blood within 1 to 2 minutes of administration. For similar doses of the drug, however, smoking produced lower levels of heroin in the blood. The onset of heroin-induced miosis, the constriction of the pupils, took as long when the drug was injected as when it was smoked. By either route, low and moderate doses of heroin produced miosis within 5 to 15 minutes; for high doses, smoking and injecting both caused miosis within 2 minutes. After similar periods, the subjects also reported that by either route they could "feel" the drug and perceive its pleasurable effects.

Dr. Cone says the findings suggest that people who smoke heroin may do so because the pharmacological effects are similar to those they obtain by injecting the drug.

Although reliable epidemiological data on heroin smoking are not available, says Dr. Cone, some researchers believe that the practice may be growing in popularity among heroin users, due in part to a fear of HIV infection. Needle sharing, a common practice among injecting drug users, accounts for many cases of HIV infection. Smoking heroin also may make it easier for some people to start using the drug, particularly those who have been deterred by the prospect of injecting themselves with needles.

Estimated Total Number of Heroin-Related Hospital Emergency Department Visits 1988-1993



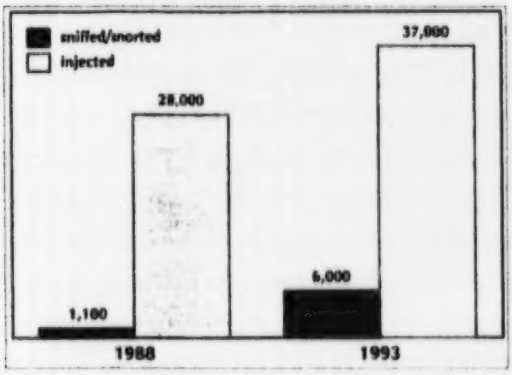
Source: *Preliminary Estimates from the Drug Abuse Warning Network 1993 Preliminary Estimates of Drug-Related Emergency Department Episodes Substance Abuse and Mental Health Services Administration, December, 1994*

"Many people just hate the idea of needles," says Dr. Wayne Wiebel, a NIDA-funded researcher at the University of Illinois in Chicago. Dr. Wiebel notes that there have been sporadic reports of smoking among heroin users in Chicago and other large cities in recent years. However, he says, heroin smoking does not appear to be on the verge of becoming widespread.

"It is certainly not a trend, and it is not showing up in a major way," Dr. Wiebel says. Rather, the main shift seems to be a decline in the proportion of users who are injecting heroin and an increase in those who are snorting or inhaling it. This shift, he says, may be contributing to

Increasing purity of heroin makes snorting/inhaling a realistic alternative to injecting and may be contributing to reported increases in hospital emergency department visits.

Heroin-Related Hospital Emergency Department Visitsby Reported Route of Administration 1988-1993



Source: *Preliminary Estimates from the Drug Abuse Warning Network 1993 Preliminary Estimates of Drug-Related Emergency Department Episodes Substance Abuse and Mental Health Services Administration, December, 1994*

increases in anecdotal reports of first-time heroin use among teenagers and young adults in U.S. inner cities. He adds that the increasing use of heroin among this age group eventually might supplant the cocaine epidemic in those areas.

Nationwide household and school drug use surveys have not documented the shift in usage patterns or the increase in heroin use among young people that Dr. Wiebel and other drug abuse professionals have observed. Heroin statistics are difficult to obtain from these instruments because heroin use involves less than 1 percent of the population and many heroin users are not part of a traditional household.

Although officials caution that estimates of drug-related hospital emergency visits could increase or decrease over time for reasons unrelated to the size of the drug-using population, these estimates at least hint of a change in heroin use in recent years. Between 1992 and 1993, heroin-related hospital emergency department visits increased by 35 percent, from 5,900 to 7,900 among people ages 18 to 25, according to the Drug Abuse Warning Network (DAWN), a national survey conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA). During the same period, cocaine-related hospital emergencies changed little among this age group.

The DAWN survey also found that, between 1988 and 1993, the number of hospital emergency department visits related to snorting or sniffing heroin jumped by 470 percent, from 1,100 to 6,000. SAMHSA officials point out, however, that despite this increase, hospital emergencies related to snorting composed just 20 percent of the increase in heroin-related emergencies over this period and still constitute less than 10 percent of the total number of heroin-related hospital emergencies.

Regardless of how users take the drug, an increase in the purity of heroin could be one reason for the increase in hospital emergency department visits. According to a report by the U.S. Drug Enforcement Administration, the purity of an ounce of heroin purchased on the street rose from 34 percent in 1990 to 66 percent in 1993. The greater purity of heroin could result in more overdoses and, in turn, more hospital visits.

Both Dr. Wiebel and Dr. Cone say they believe that the increasing purity of heroin also is probably one factor that accounts for the reports of higher rates of snorting and smoking heroin. High-purity heroin makes getting high easier for people who use these less efficient routes of administration.

Source

- Jenkins, A.J.; Keenan, R.M.; Henningfield, J.E.; and Cone, E.J. Pharmacokinetics and pharmacodynamics of smoked heroin. *Journal of Analytical Toxicology* 18:317-330, 1994. NN

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